Science Objectives and Use of GLOBE Data

Atmosphere	
Combined Atmosphere, Surface, & Soil Temperature	• Help scientists calculate the rate of heat exchange between the atmosphere and the soil (see also entries for Atmosphere Temperature & Soil Temperature)
Clouds	• Help tie new measurements of clouds by automated sensors to long-term historical data records of human observations • Help to identify cloud type more accurately than is possible by remote sensing • Contribute to determination of how cloud climatology may be changing (a major issue in assessing climate change) • Contribute to improved interpretation of satellite observations of Earth's radiative balance
Air Temperature, Precipitation, and Relative Humidity	• Provide a denser network of observations than is available using only official weather stations • Provide finer resolution data crucial for investigating localized variations (e.g., urban heat islands, microclimates) • Augment data needed for regional forecasts and climate records in areas of the world where there are few official weather stations
Aerosol	• Provide calibrated ground-based observations to help assess the performance of space-based instruments and to fill in the global views of aerosol distributions provided by satellite remote sensing • Detect the presence of dust, smoke, and other aerosols and help scientists track their movement around the world
Ozone	• Identify areas of high and low ozone concentrations and the times of year and weather conditions when they occur • Help scientists interpret satellite observations of the total column density of ozone • Provide quantitative measurements of ozone to help local agencies and others know how much ozone is present to affect plants and animals

Hydrology	Improve the monitoring of surface waters both inland and along the coasts of oceans and seas
Transparency	• Determine how far light can penetrate the water and support the growth of algae and submerged aquatic vegetation
Temperature	• Determine the overturning of lakes • Track the mixing of waters in estuaries and along coasts • Help determine evaporation rates • Help scientists determine what can live in the water
pH	• Help scientists determine what can live in the water, both animals and plants • Track the mixing of waters in estuaries and along coasts • Help scientists relate water quality to surrounding soil and geology and to the pH of rain and snow melt
Conductivity	• Determine the overall loading of salts and other compounds dissolved in fresh water • Help determine the usability of fresh water for different purposes
Salinity	• Track the mixing and source of waters in estuaries and along coasts • Help track the state of saline inland waters
Alkalinity	• Help determine the vulnerability of fresh waters to changes in pH from inputs of acidity
Dissolved Oxygen	• Determine what animals can live in the water • Help scientists determine the mixing of air and water at the water's surface
Nitrates	• Help scientists determine the potential uses of water • Help determine the effects of inputs of nutrients on a water body
Fresh Water Macroinvertebrates	• Help determine the biodiversity of a fresh water ecosystem • Help scientists determine the overall state of a water body
Marine Macroinvertebrates	• Help determine the biodiversity of coastal beach ecosystems • Help determine the overall state of coastal beach ecosystems • Test the hypothesis that the distributions of marine animals will change with climate change

Soil	
Temperature	- Provide new data for tracking climate and annual cycles - Help scientists determine times of pest emergence and plant sprouting - Help determine heat transport in near-surface soil - Help scientists monitor the energy balance of the Earth system
Moisture	- Help track the water cycle in the Earth system - Help determine the times of plant sprouting and growth - Help scientists improve weather and climate prediction - Compare with existing models and data sets for validation and for local detail
Field Characterization (structure, color, consistence, texture, and the presence of rocks, roots, & carbonates)	- Help scientists create soil maps - Help track the global carbon cycle - Provide information for interpretation of soil temperature and moisture measurements
pH	- Help determine what can grow in the soil - Help determine the effect on the pH of water flowing through the soil
Bulk Density	- Help in the interpretation of soil temperature and moisture measurements - Help determine soil porosity (volume of empty space for air and water) in combination with Particle Density
Particle Density	- Help determine soil porosity (volume of empty space for air and water) in combination with Bulk Density - Provide some indication of mineral versus organic content of soils - Help in the interpretation of soil temperature and moisture measurements
Fertility	- Indicate the suitability of the soil for supporting growth of crops and other plant life - Provide indication of nitrate and phosphate inputs to water bodies
Particle Size Distribution	- Determine the mixture of sand, silt, and clay particles in soil - Help determine the appropriate uses of a soil

Land Cover	Help scientists study the terrestrial components of the energy, water, carbon, nitrogen, and other cycles of the Earth system Help in the understanding of local climate and watersheds
Sample Site	• Classify land cover for comparison with maps derived from satellite remote sensing
Biometry	• Help scientists determine the amount of biomass present • Help validate land cover classifications of sample sites
Mapping	• Guide systematic observation of land cover classification
Change	• Determine land cover change in support of the study of changes in local climate, watersheds, and the cycles of the Earth system

Phenology	Help scientists detect the nature and extent of climate change and its effects on plants and animals
Green-up, Green-down Budburst, Lilacs, Phenology Gardens	• Delineate the length, start and end of the growing season • Help scientists interpret satellite observations of greenness
Hummingbirds	• Determine changes in hummingbird migration as both an indicator and response to climate changes
Seaweed Reproduction Phenology	• Determine changes in seaweed reproduction as both an indicator and response to climate changes
Arctic Bird Migration	• Determine changes in Arctic bird migration as both an indicator and response to global and regional climate changes